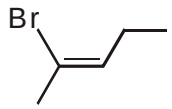
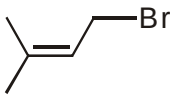
STERO ISOMERISM

EXERCISE # I (MAINS ORIENTED)

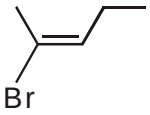
1. Which one of the following statements concerning compounds **V**–**Z** is true :



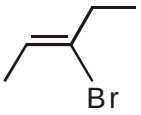
(V)



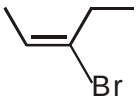
(W)



(X)



(Y)



(Z)

(A) **V** and **X** are conformational isomers
(B) **Y** and **Z** are constitutional isomers
(C) **X** and **Y** are constitutional isomers
(D) **V** and **Y** are stereoisomers

2. Which of the following compound has no isomer?
(A) $CH_3CH_2CH_2Cl$ (B) CH_3CHO
(C) $CH_2=CH–Cl$ (D) $ClCH_2CH_2Cl$

3. Compound CH_2Cl_2 contain :
(A) Plane of symmetry (B) Centre of symmetry
(C) Axis of symmetry (D) Both (A) & (C)

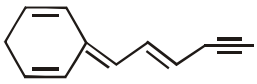
4. Number of POS present in CH_4 :
(A) 3 (B) 4 (C) 5 (D) 6

5. How many stereoisomers of the following molecule are possible ?

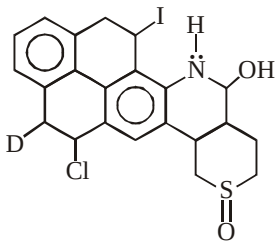
HOOC.CH=C=CH.COOH

(A) Two optical isomers (B) Two geometrical isomers
(C) Two optical and two geometrical isomers (D) None

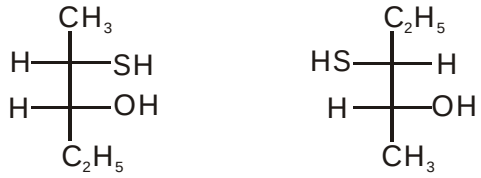
6. The number of cis-trans isomer possible for the following compound.



(A) 2 (B) 4 (C) 6 (D) 8

7.  has 'x' chiral centre then find the value of x :

(A) 7 (B) 8 (C) 6 (D) 5

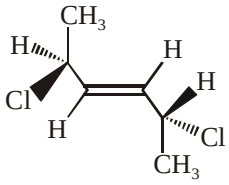
8. 

(A) Diastereomers (B) Enantiomers (C) Identical (D) Constitutional isomers

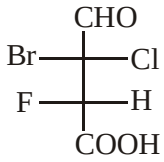
9. The number of optically active compounds in the isomers of C_4H_9Br is :

(A) 1 (B) 2 (C) 3 (D) 4

10. Compound have :

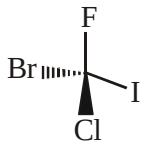
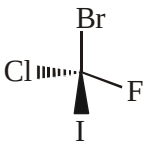


(A) Plane of symmetry (B) Centre of symmetry
(C) Axis of symmetry (D) None

11. 

Configuration of compound is :

(A) 2S, 3S (B) 2R , 3S (C) 2R , 3R (D) 2S , 3R

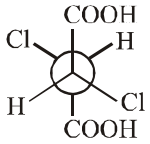
12.  &  have configuration respectively :

(A) R, S (B) S, S (C) S, R (D) R, R

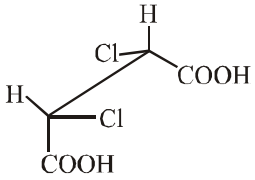
13. Minimum molecular weight of a hydrocarbon containing minimum number of C-atom to show optical isomerism :

(A) 100 (B) 80 (C) 68 (D) 70

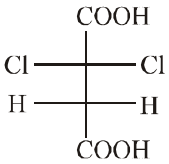
14. For the given configuration :



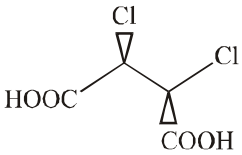
(I)



(II)



(III)

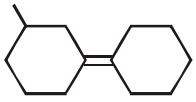


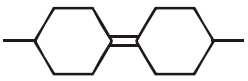
(IV)

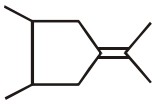
Which of the compound/configuration are optically active :

(A) I (B) II (C) III (D) IV

15. Compounds which can show both optical as well as geometrical isomerism :

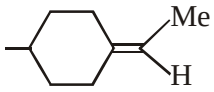
(A) 

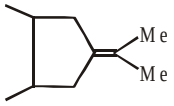
(B) 

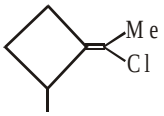
(C) 

(D)

16. Which of the following will not show optical isomerism :

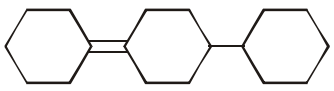
(A) 

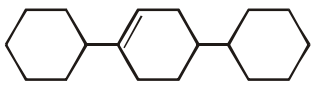
(B) 

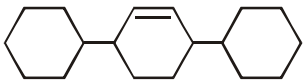
(C) 

(D)

17. Optical & geometrical isomerism both can be shown by :-

(A) 

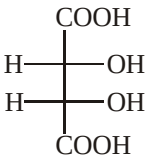
(B) 

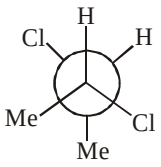
(C) 

(D)

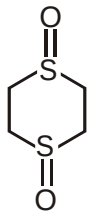
18. Which of the following will not show optical isomerism :

(A) Cl–CH=C=C=CH–Cl (B) Cl–CH=C=C=C=CH–Cl

(C) 

(D) 

19. The correct statement for the given compound is

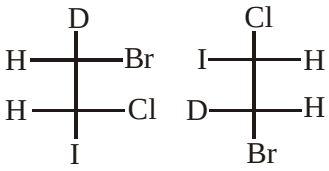


(A) It can shows geometrical isomerism (B) It can show optical isomerism
(C) It contain chiral centre (D) None of these

20. Meso-tartaric acid and d-tartaric acid are :-

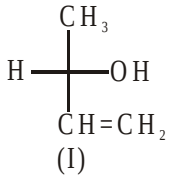
(A) Positional isomers (B) Enantiomers (C) Diastereomers (D) Racemic mixture

21. The two compounds given below are :

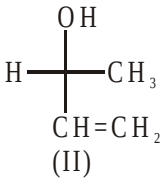


(A) Enantiomers (B) Diastereomers (C) Optically inactive (D) Identical

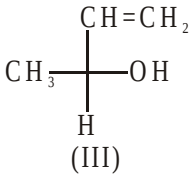
22. Which of the following combinations amongst the four Fischer projections represents the same absolute configurations ?



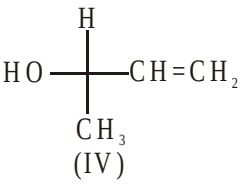
(I)



(II)



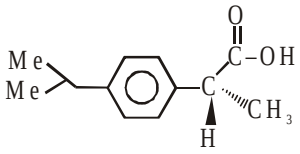
(III)

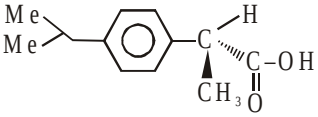


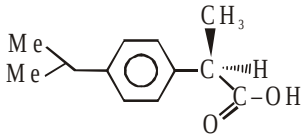
(IV)

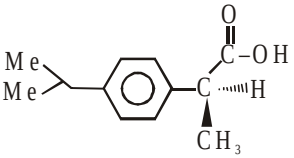
(A) (II) and (III) (B) (I) and (IV) (C) (II) and (IV) (D) (III) and (IV)

23. The S-ibuprofen is responsible for its pain relveing property. Which one of the structure shown is S-ibuprofen :

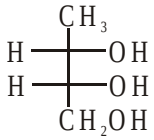
(A) 

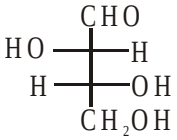
(B) 

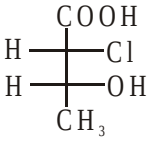
(C) 

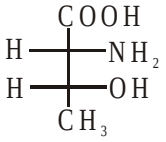
(D) 

24. Which of the following is a 'threo' isomer :

(A) 

(B) 

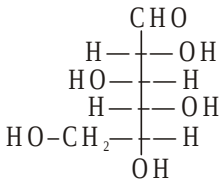
(C) 

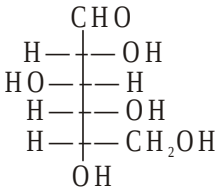
(D) 

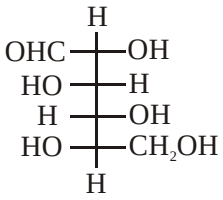
25. Number of possible stereoisomers of glucose are :-

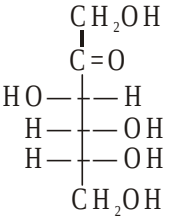
(A) 10 (B) 8 (C) 16 (D) 20

26. Which of the following is not D sugar :

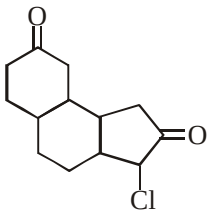
(A) 

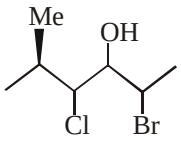
(B) 

(C) 

(D) 

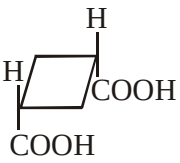
27. Number of chiral centres in [X] & [Y] is a & b respectively. The value of (a–b) is :

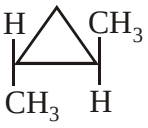
[X] = 

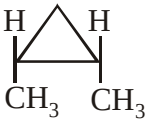
[Y] = 

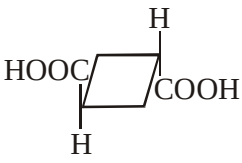
(A) 1 (B) 2 (C) 3 (D) 4

28. Which one of the following is resolvable :

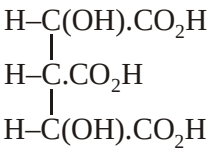
(A) 

(B) 

(C) 

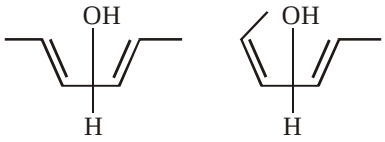
(D) 

29. How many stereoisomers can exist for the following acid.



(A) Two (B) Four (C) Eight (D) Six

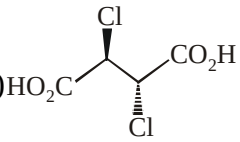
30. Incorrect relationship between given compounds are

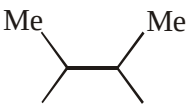


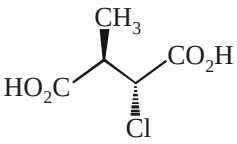
(A) Both are geometrical isomers (B) Both are stereo isomers

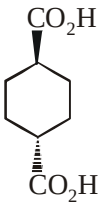
(C) Both are enantiomers (D) Both are diastereomers

31. Identify meso compound.

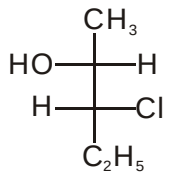
(A) 

(B) 

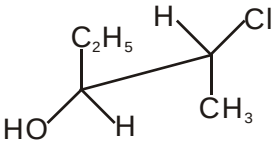
(C) 

(D) 

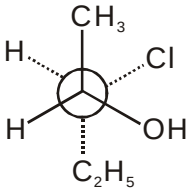
32. The two projection formulae that represent a pair of enantiomers are :-



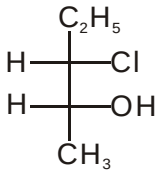
(I)



(II)



(III)



(IV)

(A) I and II (B) III and IV

(C) I and III (D) II and IV

33. A pure sample of 2-chlorobutane shows rotation of PPL by 30° in standard conditions. When above sample is made impure by mixing its opposite form, so that the composition of the mixture becomes 87.5% d-form and 12.5% ℓ-form, then what will be the observed rotation for mixture.

(A) – 22.5° (B) + 22.5° (C) + 7.5° (D) – 7.5°

34. When an optically active compound is placed in a 10 dm tube is present 20 gm in a 200 ml solution rotates the PPL by 30°. Calculate the angle of rotation & specific angle of rotation if above solution is diluted to 1 Litre.

(A) 16° & 36° (B) 6° & 30° (C) 3° & 30° (D) 6° & 36°

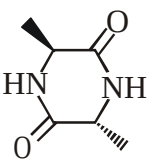
35. Identify % optical purity if 6 gm (+)-2-butanol is mixed with 2 gm (–)-2-butanol.

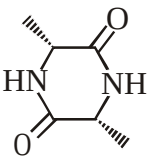
(A) 50 % (B) 66.6 % (C) 33.3 % (D) 75 %

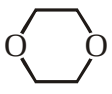
36. A mixture of d and ℓ, 2-bromobutane contain 75% d-2-bromobutane. Calculate enantiomeric excess.

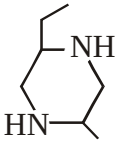
(A) 75% (B) 25% (C) 50% (D) 100%

37. Which of the following is example of meso compound?

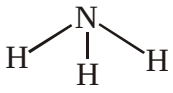
(A) 

(B) 

(C) 

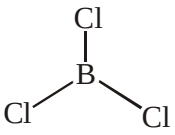
(D) 

38. Which of the following has C_2 & C_3 axis of symmetry ?

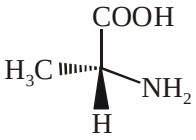
(A) 

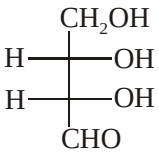
(B) H_2CCl_2

(C) $H_3C–Cl$

(D) 

39. Configuration of I & II respectively will be :



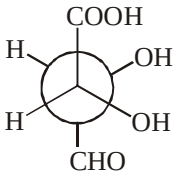


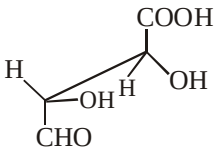
(A) D, D

(B) L , D

(C) D , L

(D) L, L

40. 



, compound related as :

(A) Enantiomers

(B) Conformation

(C) Identicle

(D) Diastereomers

EXERCISE # II (JEE-ADVANCE ORIENTED LEVEL-I)

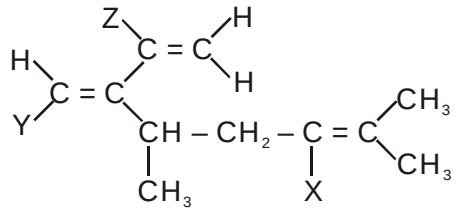
Single correct Option Type :

1. Molecular formula $C_5H_{10}O$ can have :

(A) 6-Aldehyde, 4-Ketone (B) 5-Aldehyde, 3-Ketone

(C) 4-Aldehyde, 3-Ketone (D) 5-Aldehyde, 2-Ketone

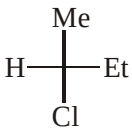
2. In the given halogenoalkene M, atoms X, Y and Z represents hydrogen or bromine or chlorine. To show cis-trans isomerism, what could be the identities of atoms X, Y and Z?

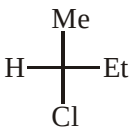


(M)

	X	Y	Z
1	Cl	H	Br
2	H	Br	Cl
3	Cl	Br	H

(A) 1, 2 and 3 (B) 1 and 2 only (C) 2 and 3 only (D) 1 and 3 only

3. **Statement–1 :**  is a chiral resolvable molecule.

Statement–2 :  is non-superimposable on its mirror image.

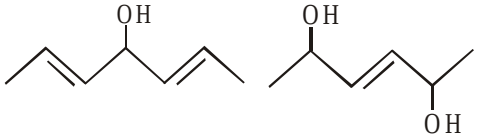
(A) Statement–1 is true, Statement–2 is true; Statement–2 is not the correct explanation of Statement–1

(B) Statement–1 is true, Statement–2 is true ; Statement–2 is the correct explanation of Statement–1

(C) Statement–1 is true, Statement–2 is false

(D) Statement–1 is false, Statement–2 is true

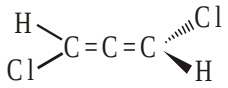
4. Total number of stereoisomer of following compounds are respectively :-

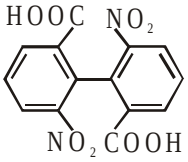


(A) 4, 6 (B) 8 (C) 6,6 (D) 8, 8

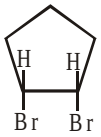
5. Which of the following compounds are optically active ?

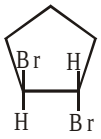
(A) $CH_3.CHOH.CH_2.CH_3$ (B) $H_2C=CH.CH_2.CH=CH_2$

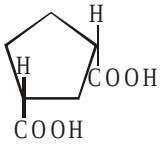
(C) 

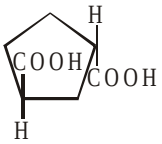
(D) 

6. Which out the following are Non-resolvable :

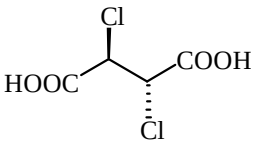
(A) 

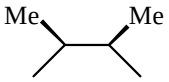
(B) 

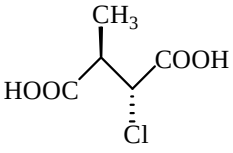
(C) 

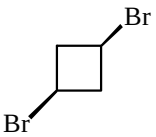
(D) 

7. Identify compound(s) which is/are not meso :

(A) 

(B) 

(C) 

(D) 

8. Which of the following statements for a meso compound is/are correct :

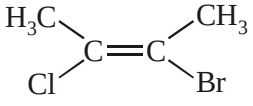
(A) The meso compound has either a plane or centre of symmetry

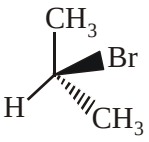
(B) The meso compound is optically inactive due to internal compensation.

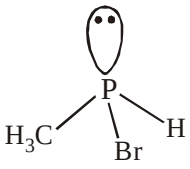
(C) The meso compound is achiral

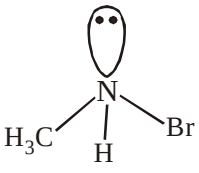
(D) The meso compound is formed when equal amounts of two enantiomers are mixed

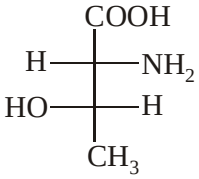
9. Among the following the non- resolvable compound is/are :

(A) 

(B) 

(C) 

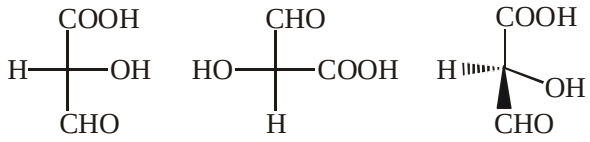
(D) 

10. Compound 

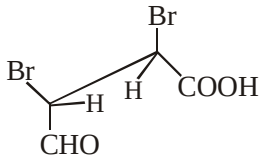
is/are ?

(A) (2R, 3S), L (B) L, Erythreo (C) Threo , D (D) (2R, 3S), D

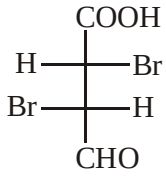
11. Relation between compounds are :

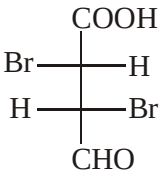


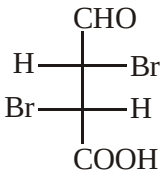
(A) I & II = Enantiomers
(B) II & III = Enantiomers
(C) I & II = Identical
(D) II & III = Identical

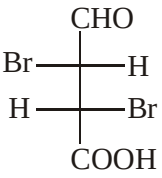
12. 

has fisher diagram ?

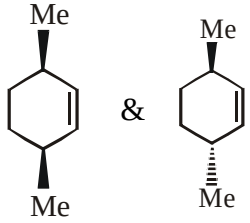
(A) 

(B) 

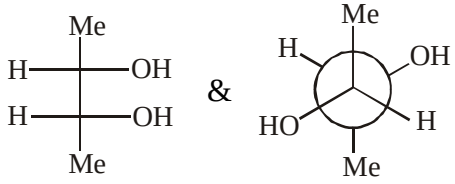
(C) 

(D) 

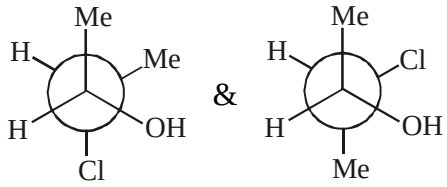
13. Identify correct relation between pair of compounds ?

(A) 

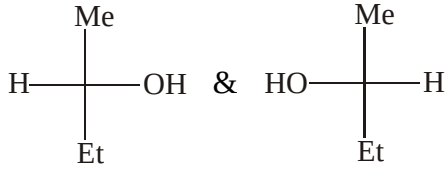
Diastereomers

(B) 

Identical

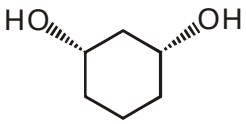
(C) 

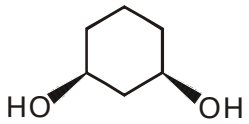
Diastereomers

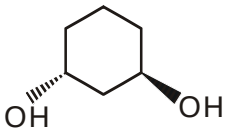
(D) 

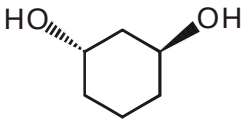
Enantiomers

14. Which two of the following compounds represents a pair of enantiomers?

(I) 

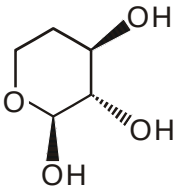
(II) 

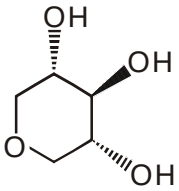
(III) 

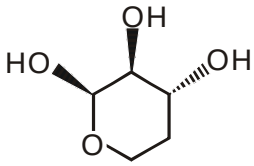
(IV) 

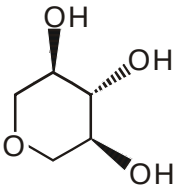
(A) I & II (B) II & III (C) III & IV (D) II & IV

15. Which two of the following compounds are diastereomers?

(I) 

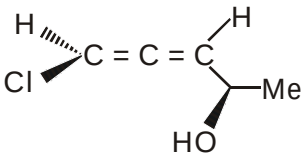
(II) 

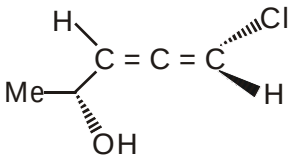
(III) 

(IV) 

(A) I & II (B) II & IV (C) III & IV (D) I & III

16. The correct relation between the following compounds is :

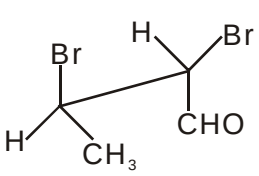




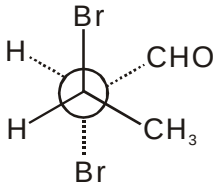
(A) Enantiomers (B) Diastereomers

(C) Homomers (Identical) (D) Constitutional isomers

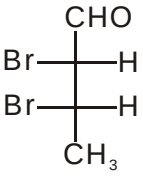
17. Identify the correct statement regarding following molecules?



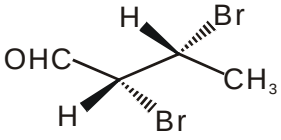
(M)



(N)



(O)



(P)

(A) **M** and **O** are diastereomers

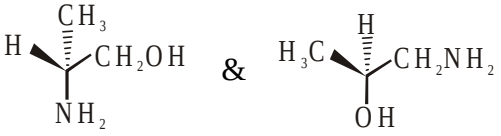
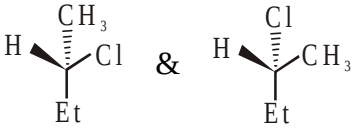
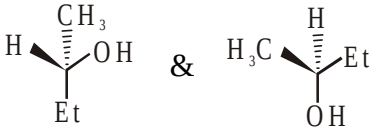
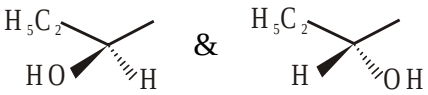
(B) **N** and **P** are enantiomers

(C) **M** and **N** are identical

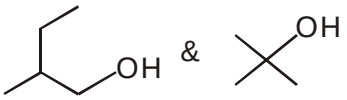
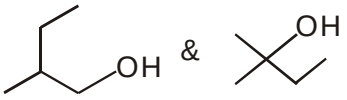
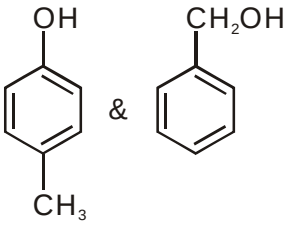
(D) **O** and **P** are diastereomers

Matrix Match Type :

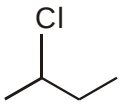
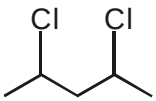
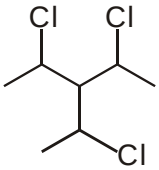
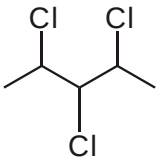
18.

Column I	**Column II**
(A) 	(P) Structural
(B) 	(Q) Identical
(C) 	(R) Enantiomers
(D) 	(S) Diastereomers

19. Match the column :-

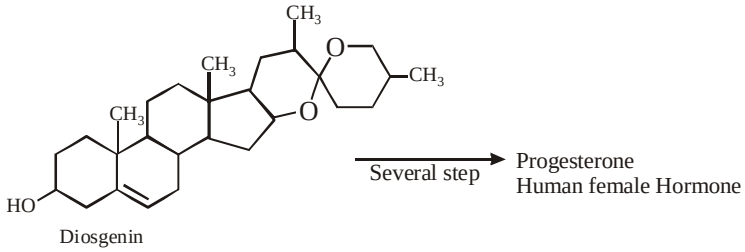
	Column-I		Column-II
(1)		(P)	Position isomers
(2)		(Q)	Chain isomers
(3)		(R)	Homologues
(4)		(S)	Functional isomers

20. Match the column–I :-

	Column-I (Compounds)		Column-II (Total number of stereoisomers)
(1)		(P)	8
(2)		(Q)	4
(3)		(R)	3
(4)		(S)	2

Subjective Type :

21.

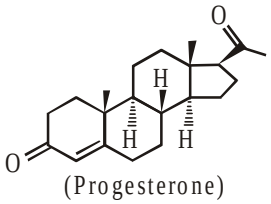


Diosgenin

What is number of chiral centres present in Diosgenen is :

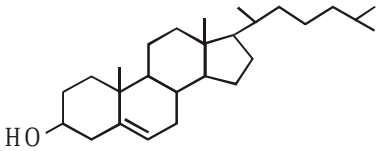
22. Calculate the total number of chrial carbon atoms in.

(i)



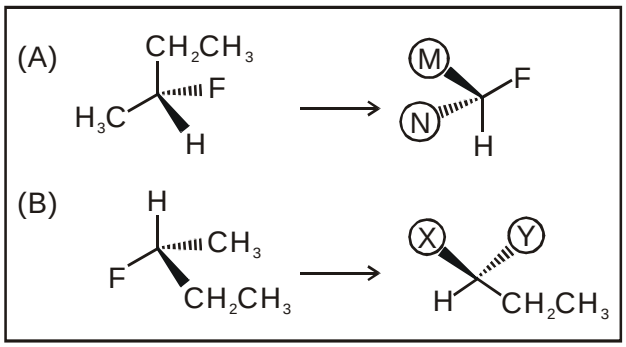
(Progesterone)

(ii)



23. Total number of isomeric (including stereo) bromochlorofluoroiodo propadiene.

24. Re-orient the molecule at the left to match the partially drawn perspective at the right. Find the two missing substituents at their correct positions.



(A) $\mathbf{M} = CH_3CH_2-$ $\mathbf{N} = CH_3-$

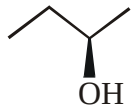
(B) $\mathbf{X} = CH_3-$ $\mathbf{Y} = F-$

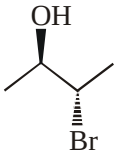
(C) $\mathbf{M} = CH_3-$ $\mathbf{N} = CH_3CH_2-$

(D) $\mathbf{X} = F-$ $\mathbf{Y} = CH_3-$

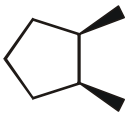
25. Find out the total number of cyclic isomers of C_6H_{12} which are optically active ?

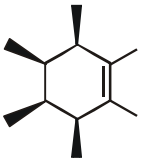
26. How many of the given compounds are chiral :

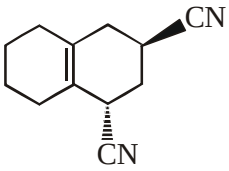
(i) 

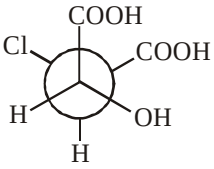
(ii) 

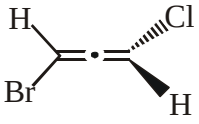
(iii)

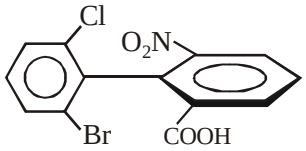
(iv) 

(v) 

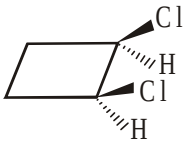
(vi) 

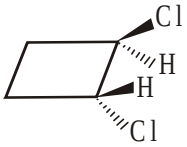
(vii) 

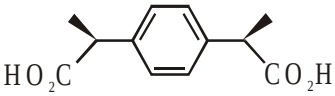
(viii) 

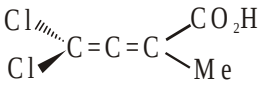
(ix) 

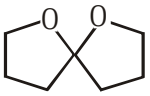
27. With reasons, state whether each of the following compounds I to VIII is chiral

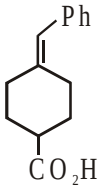
(I) 

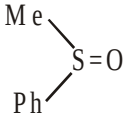
(II) 

(III) 

(IV) 

(V) 

(VI) 

(VII) 

28. How many cyclopentane structures (including stereo) are possible for C_7H_{14}.

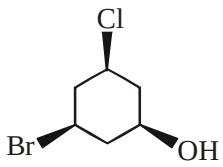
29. The number of diastereoisomers (excluding enantiomers) for 1-bromo-2-chloro-3-iodocyclopropane.

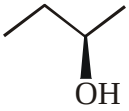
30. Identify total number of stereoisomers for the following compound :

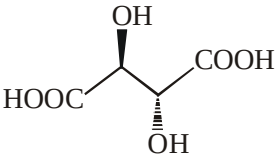
CH_2-CH(OH)-CH(Cl)-CH=CH-CH_3

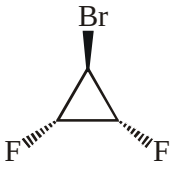
31. How many of the given molecule / species are chiral :

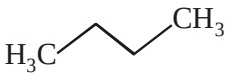
(I)

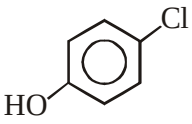
(II) 

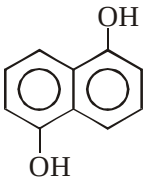
(III) 

(IV) 

(V) 

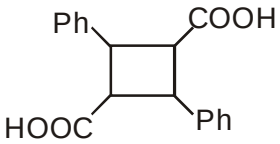
(VI) 

(VII) 

(VIII) 

(IX) CH_4

32. Total geometrical isomers possible for :

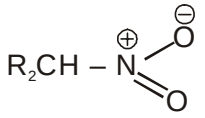


(A) 3 (B) 4 (C) 5 (D) 8

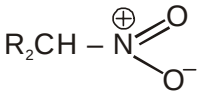
EXERCISE # III (JEE-ADVANCE ORIENTED LEVEL # II)

Single Correct Type :

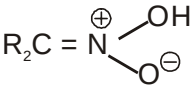
1. The correct statements describing the relationship between :



(X)



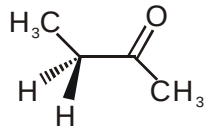
(Y)



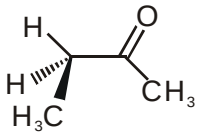
(Z)

(A) **X** and **Y** are resonance structures and **Z** is a tautomer
(B) **X** and **Y** are tautomers and **Z** is resonance structure
(C) **X**, **Y** and **Z** are all resonance structures
(D) **X**, **Y** and **Z** all are tautomers

2. The correct statements about conformations X and Y of 2-butanone are :



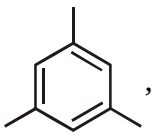
(X)



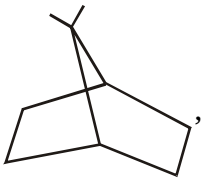
(Y)

(a) **X** is more stable than **Y**
(b) **Y** is more stable than **X**
(c) Methyl groups in **X** are anti
(d) Methyl groups in **Y** are gauche
(A) a and d (B) a and c (C) b and c (D) a, c and d

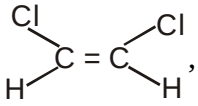
3. Among the following, the number of molecules that possess C_2–axis of symmetry is :



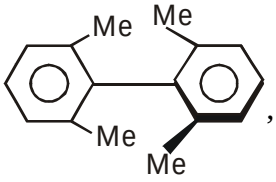
,



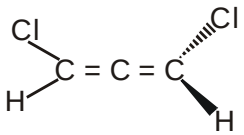
, CH_4,

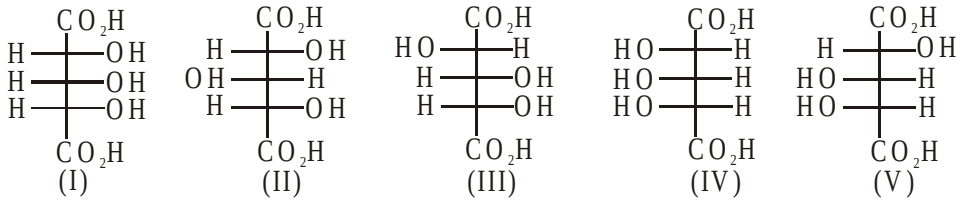


, BF_3,



, $CHCl_3$, 2,5-dimethylthiophene,





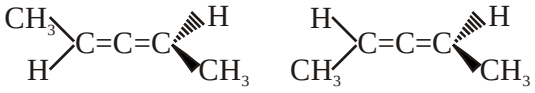
(i) Which of the above formulae represent identical compounds ?

(A) I and II (B) I and IV (C) II and IV (D) III and IV

(ii) Which of the above compounds are enantiomers ?

(A) II and III (B) III and IV (C) III and V (D) I and V

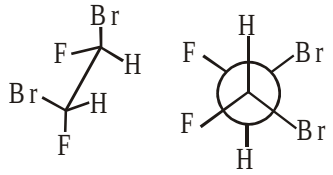
5. Which of the following option is correct regarding the given compounds :

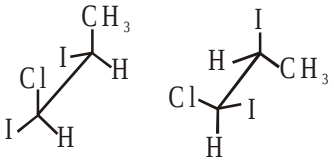


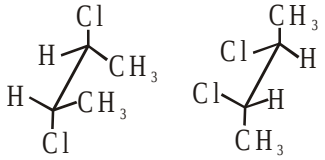
(A) Both are identical (B) Both are optically inactive

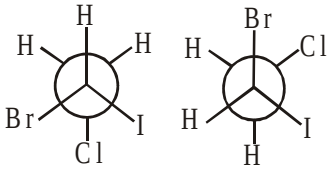
(C) Both are enantiomers (D) Geometrical isomer

6. Which of the following pairs of compound is/are identical ?

(A) 

(B) 

(C) 

(D) 

Multiple Correct Type :

7. Which of the following statements is/are not correct for D-(+) glyceraldehyde :

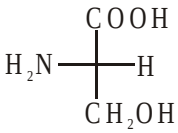
(A) The symbol D indicates the dextrorotatory nature of the compound

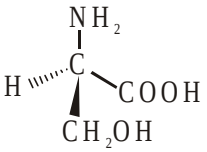
(B) The sign(+) indicates the dextrorotatory nature of the compound

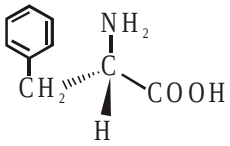
(C) The symbol D indicates that (–OH) group lies left to the chiral centre in the conventionally correct Fischer projection diagram

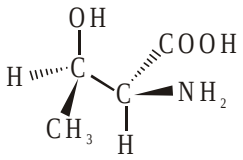
(D) The symbol D indicates that (–OH) group lies right to the chiral centre in the conventionally correct Fischer projection diagram

8. Which of the following are correct representation of L-amino acids :

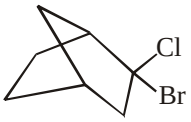
(A) 

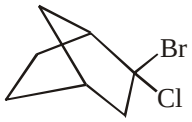
(B) 

(C) 

(D) 

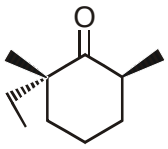
9. Identify relation between these two compounds :

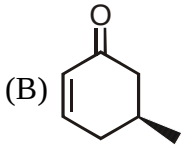


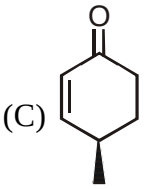


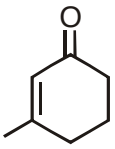
(A) Homomers (B) Enantiomers (C) Diastereomers (D) Positional Isomers

10. Which of the following undergoes racemisation in alkaline medium?

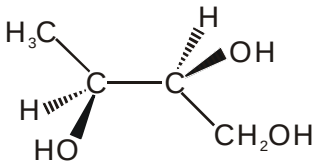
(A) 

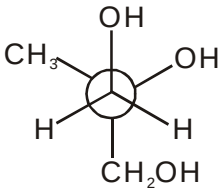
(B) 

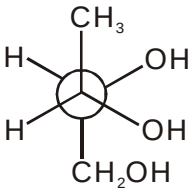
(C) 

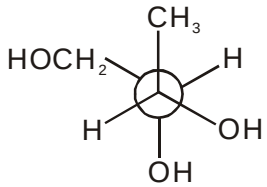
(D) 

11. Which compound is different from the others?

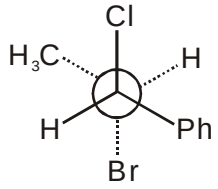
(A) 

(B) 

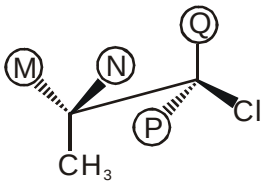
(C) 

(D) 

12.



(X)



(Y)

What would be the correct match to get (**Y**) as a diastereomers of (**X**)?

(A) **M** = – H **Q** = – Ph
N = – Br **P** = –H

(B) **M** = – H **Q** = – H
N = – Br **P** = –Ph

(C) **M** = – Br **Q** = – Ph
N = – H **P** = –H

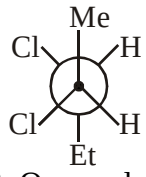
(D) **M** = – Br **Q** = – H
N = – H **P** = –Ph

Comprehension Type :

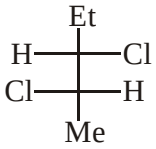
Paragraph for Question 13 and 14

Four compounds are given below 'S' is a stereoisomer of P.

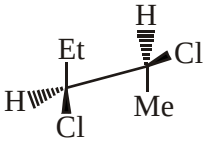
(P)



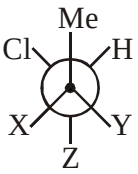
(Q)



(R)



(S)



13. P & Q are related as :

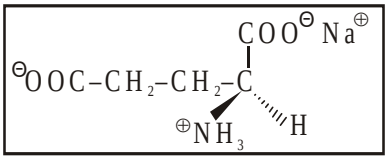
(A) Identical (B) Enantiomer (C) Diastereomer (D)Positional isomerism

14. Which of the above structures represented is Sawhorse projection :-

(A) P (B) Q (C) R (D) S

Paragraph for Question 15 to 17

S(+) Mono sodium Glutamate (MSG) is a flavour enhancer used in many foods. Fast foods often contain substantial amount of MSG and is widely used in Chinese food. If one mole of above MSG was placed in 845 ml solution and passed through 200 mm tube, the observed rotation was found to be + 9.6°.



15. Find out the specific rotation of (–) MSG :

(A) + 24° (B) +56.8º (C) –48° (D) None of these

16. Find out the approximate percentage composition of (–) MSG in a mixture containing (+) MSG and (–) MSG whose specific optical rotation is –20° :

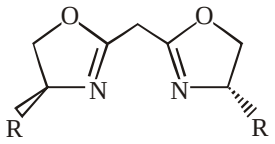
(A) 83.3% (B) 16.7% (C) 91.6% (D) 74%

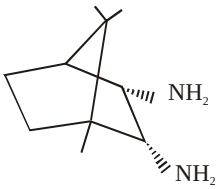
17. If 33.8 g of (+) MSG was put in 338 ml solution and was mixed with 16.9g of (–) MSG put in 169 ml solution and the final solution was passed through 400 mm tube. Find out observed rotation of the final solution :

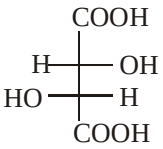
(A) +1.6° (B) +4.8° (C) +3.2° (D) None of these

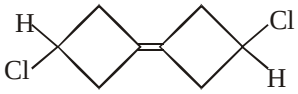
Paragraph for Q.18 and Q.19

Among the following structures ?

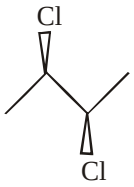
(I) 

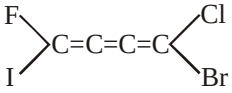
(II) 

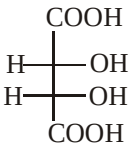
(III) 

(IV) 

(V)

(VI) 

(VII) 

(VIII) 

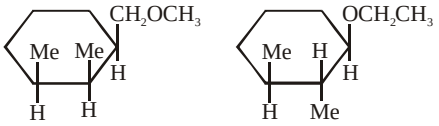
18. Optically active compound is -

(A) III (B) IV (C) V (D) VII

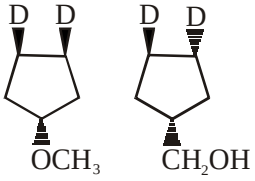
19. Which of the following will not show optical isomerism -

(A) I (B) II (C) V (D) VIII

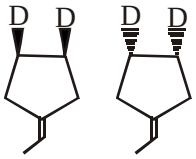
20. **Column-I (Compounds)** **Column-II (Relation)**

(A) 

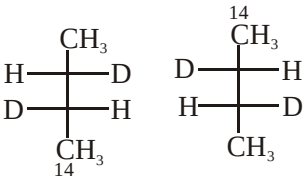
(P) Metamers

(B) 

(Q) Functional Isomer

(C) 

(R) Geometrical isomer

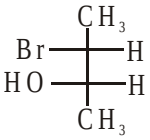
(D) 

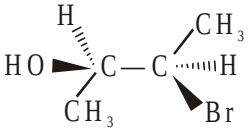
(S) Enantiomer

(T) Diastereomer

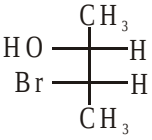
21. Match List-I, II, III with each other :

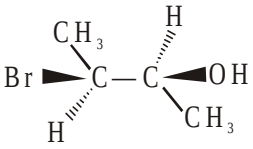
List - I **List - II** **List - III**

(A) 

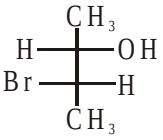
(1) 

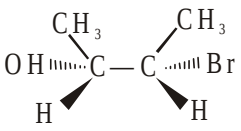
(i) (2R, 3R)

(B) 

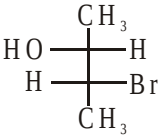
(2) 

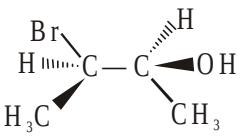
(ii) (2S,3S)

(C) 

(3) 

(iii) (2S,3R)

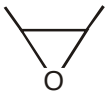
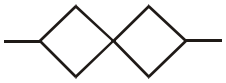
(D) 

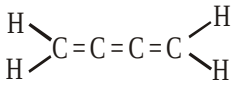
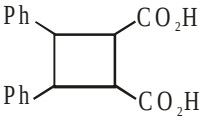
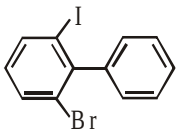
(4) 

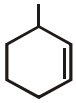
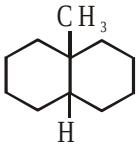
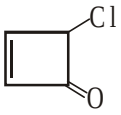
(iv) (2R,3S)

Subjective Type :

22. In what stereoisomeric forms would you expect the following compounds to exist ?

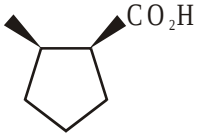
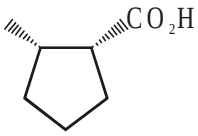
(a) $EtCH(CO_2H)Me$ (b) $MeCH(CO_2Et)CO_2H$ (c)  (d) 

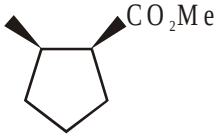
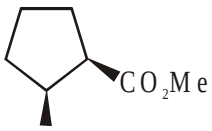
(e)  (f) Et(Me)C=C=C(Me)Et (g)  (h) 

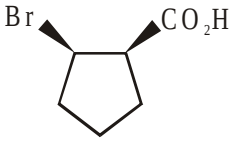
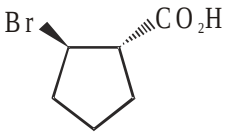
(i)  (j)  (k) 

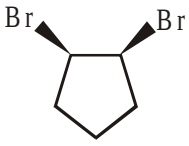
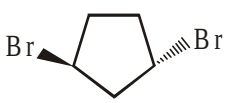
23. Calculate the number of Benzenoid isomers possible for C_6H_3ClBrI.

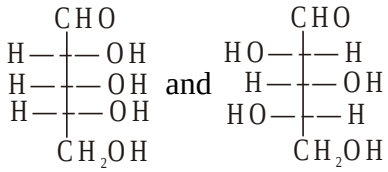
24. What are the relationships between the following pairs of isomers ?

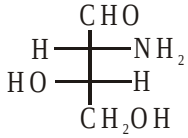
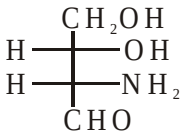
(a)  and 

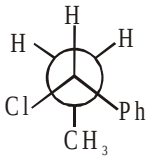
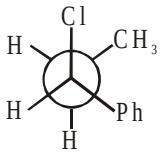
(b)  and 

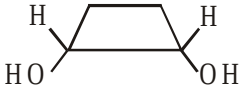
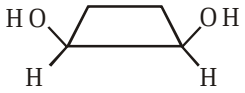
(c)  and 

(d)  and 

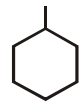
(e)  and

(f)  and 

(g)  and 

(h)  and 

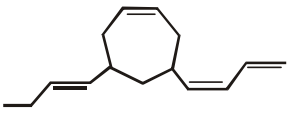
(i) and

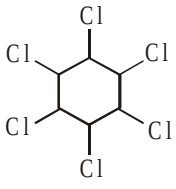
25. X 

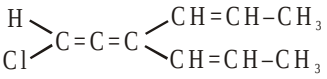
Find out total number of structures of X.

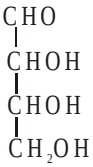
26. Calculate the number of chiral center in the molecule Ethyl 2,2-dibromo-4-ethyl-6-methoxy cyclohexane carboxylate.

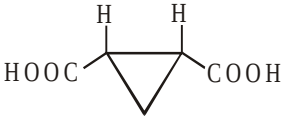
7. Calculate the total number of stereoisomers possible for

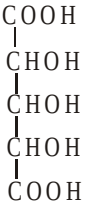
(i) 

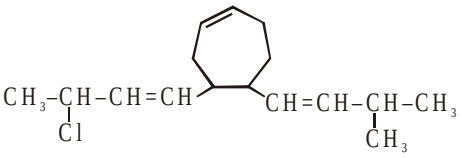
(ii) 

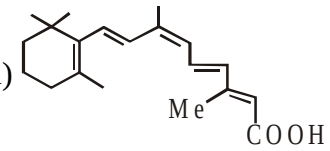
(iii) 

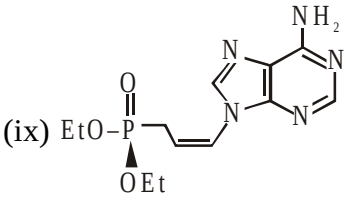
(iv) 

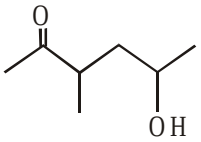
(v) 

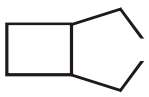
(vi) 

(vii) 

(viii) 

(ix) 

(x) 

(xi) 

28. How many different chloroethanes are there from the formula $C_2H_{6-n}Cl_n$ (where n can be any integer from 1 to 6)?

ANSWER - KEY

EXERCISE # I (MAINS ORIENTED)

1. Ans.(C) **2. Ans.(C)** **3. Ans.(D)** **4. Ans.(D)**

5. Ans.(A) **6. Ans.(A)** **7. Ans.(A)** **8. Ans.(D)**

9. Ans.(B)

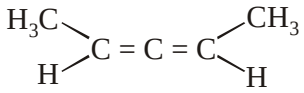
$C_4H_9Br \Rightarrow CH_3-CH_2-CH_2-\underset{Br}{CH_2}$, $CH_3-CH_2-\overset{*}{\underset{Br}{C}}H-CH_3$, $CH_3-\underset{Br}{\overset{CH_3}{\overset{|}{C}}}-CH_3$, $CH_3-\underset{Br}{\overset{CH_3}{\overset{|}{C}}}H-CH_2$

(Optically active)

Optically active isomers $\Rightarrow 2$

10. Ans.(B) **11. Ans.(D)** **12. Ans.(A)**

13. Ans.(C)



14. Ans.(B) **15. Ans.(C)** **16. Ans.(D)**

17. Ans.(C)

18. Ans.(A)

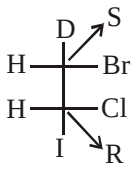
Cl–CH=C=C=CH–Cl is a planar structure

19. Ans.(A)

20. Ans.(C)

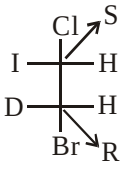
Meso tartaric acid and d-fartaric acid and not mirror image of each other so they are diastereomers.

21. Ans.(A)



(I)

and

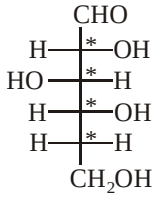


(II)

Enantiomers (I & II are mirror image of each other)

22. Ans.(C) **23. Ans.(D)** **24. Ans.(B)**

25. Ans.(C)



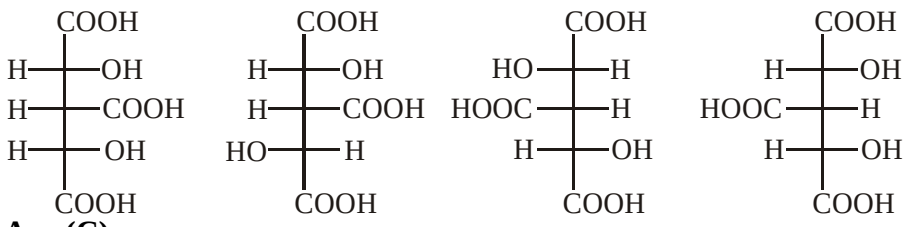
$2^n \Rightarrow 2^4 \Rightarrow 16$

26. Ans.(B) **27. Ans.(B)**

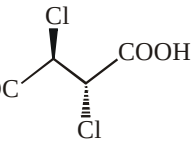
28. Ans.(B)

Optically active compounds are resolvable.

29. Ans.(B)



30. Ans.(C)

POS is present in 

32. Ans.(C)

33. Ans.(B)

e.e = 87.5 – 12.5 $\Rightarrow$ 75 % of

$$ee = \frac{\text{Rotation by mixture}}{\text{Rotation by pure isomer}} \times 100$$

$$75 = \frac{X}{30} \times 100$$

$$X = \frac{75 \times 30}{100} = +22.5^{o}$$

34. Ans.(B)

ℓ = 10 dm

c = 20 gm/200 ml

$\alpha = 30^{o}$

$$[\alpha]_{specific} = \frac{\alpha_{obs}}{c.l} = \frac{30}{\frac{20}{200} \times 10} \Rightarrow 30^{o}$$

$\alpha_{obs.}$ after dilution

$\alpha_{obs} = \alpha_{sp}$ c.p.

$$\alpha_{obs} = 30 \times \frac{20}{1000} \times 10 \Rightarrow 6^{o}$$

35. Ans.(A)

$$\% \text{ optical purity} = \frac{|d - \ell|}{d + \ell} \times 100 = \frac{4}{8} \times 100 = 50\%$$

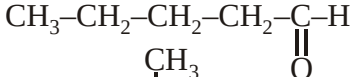
36. Ans.(C) **37. Ans.(A)** **38. Ans.(D)** **39. Ans.(C)** **40. Ans.(A)**

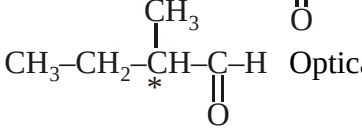
EXERCISE-II (JEE-ADVANCE ORIENTED LEVEL-I)

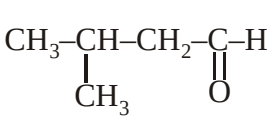
Single correct Option Type :

1. Ans.(B)

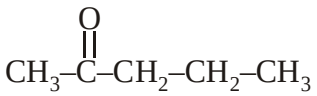
$C_5H_{10}O$: **Ketones**

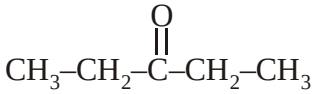
(i) 

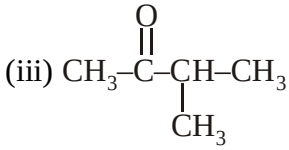
(ii)  Optical active (Two)

(iii) 

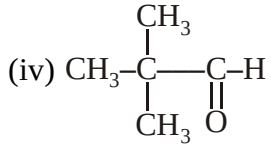
Total $\Rightarrow$ 5 aldehyde

(i) 

(ii) 

(iii) 

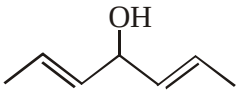
Total $\Rightarrow$ 3 ketones

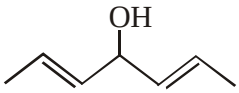
(iv) 

2. Ans.(C)

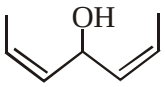
3. Ans.(D)

4. Ans.(A)

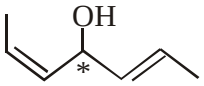


$\Rightarrow$ (i) 

(Trans, Trans)

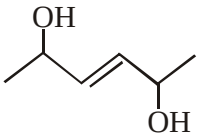
(ii) 

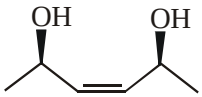
(Cis , Cis)

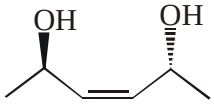
(iii) 

(Cis , Trans) Two $\Rightarrow$ R + S

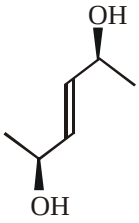
Total is isomers = 4



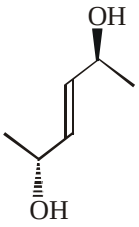
$\Rightarrow$ (i) 

(ii) 

($\pm$) Two

(iii) 

($\pm$) Two

(iv) 

Total = 6 isomer

5. Ans.(A,C,D)

6. Ans.(A,C)

Optically active compounds are resolvable and A & C are optically inactive

7. Ans.(B,C,D) **8. Ans.(A,B,C)** **9. Ans.(A,B,D)**

10. Ans.(C,D) **11. Ans.(A,D)** **12. Ans.(A,C)**

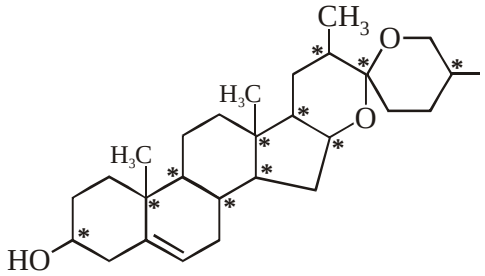
13. Ans.(A,B,C,D) **14. Ans.(C)** **15. Ans.(D)**

16. Ans.(C) **17. Ans.(D)**

18. Ans.(A)$\rightarrow$P ; (B)$\rightarrow$R ; (C)$\rightarrow$Q ; (D)$\rightarrow$R

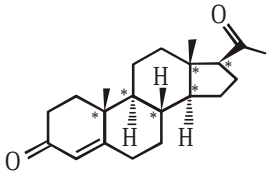
19. Ans.(1$\rightarrow$R, 2$\rightarrow$P, 3$\rightarrow$Q, 4$\rightarrow$S)

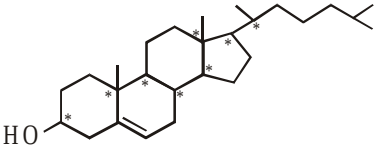
20. Ans.(1$\rightarrow$S, 2$\rightarrow$R, 3$\rightarrow$Q, 4$\rightarrow$Q)



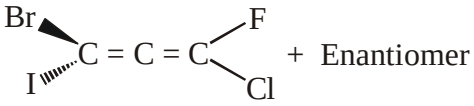
22. Ans. (i) 6, (ii) 8

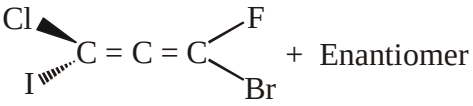
Explanation

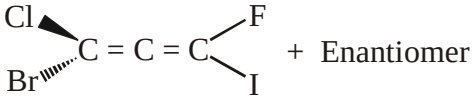
(i) 

(ii) 

23. Ans.(6)

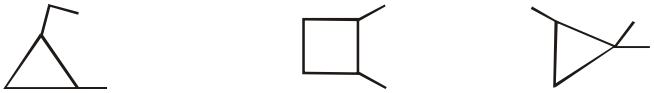
 + Enantiomer

 + Enantiomer

 + Enantiomer

24. Ans.(A,B)

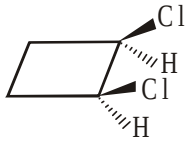
25. Ans.(8)

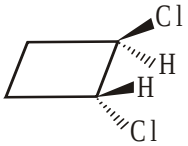


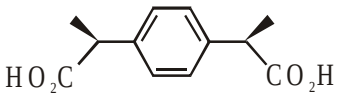
4 Optically Active Isomers 2 Optically Active 2 Optically Active

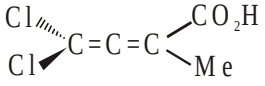
2 + 2 + 4 = 8

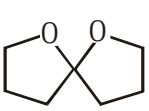
26. Ans.(6)

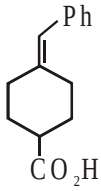
(I) 

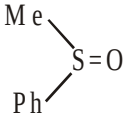
(II) 

(III) 

(IV) 

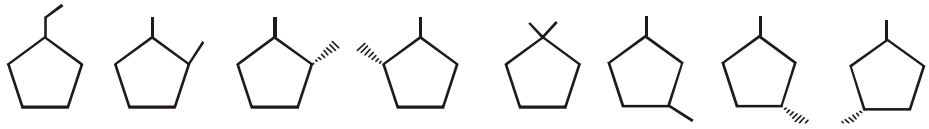
(V) 

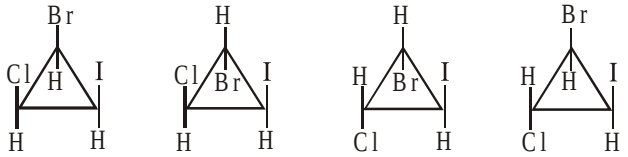
(VI) 

(VII) 

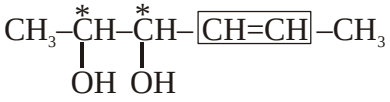
27. Ans. Achiral : I, III , IV ; Chiral : II,V, VI, VII

28. Ans.(8)





30. Ans.(8)



Stereogenic centre = 3

Total number of stereoisomer = $2^3 = 8$

31. Ans.(3)

32. Ans.(C)

EXERCISE#III (JEE-ADVANCE ORIENTED LEVEL # II)

Single Correct Type :

1. Ans.(A) **2. Ans.(D)** **3. Ans.(8)**

4. Ans.(i)-(B) ; (ii)-(C) **5. Ans.(C)** **6. Ans.(C)**

Multiple Correct Type :

7. Ans.(A,C) **8. Ans.(A,C,D)** **9. Ans.(C)**

10. Ans.(C) **11. Ans.(B)** **12. Ans.(A,D)**

Comprehension Type :

13. Ans.(B) **14. Ans.(C)**

15. Ans.(D)

M.W. of MSG = 169

$$C = \frac{169 \text{ gm}}{845 \text{ ml}}$$

ℓ = 200 mm = 2 dm

α_{obs} = +9.6°

$$[\alpha]_{sp} = \frac{\alpha_{obs}}{C.\ell.} = \frac{9.6}{\frac{169}{845} \times 2} = -24^\circ$$

16. Ans.(C)

$$ee = \frac{[\alpha]_{mixture}}{[\alpha]_{pure}} \times 100 = \frac{-20^\circ}{-24^\circ} \times 100 = 83.3^\circ$$

$\therefore$ RM = 100 – 83.3 $\Rightarrow$ 16.7 % → d = 8.35, l = 8.35

Total (–) MSG = 83.3 + 8.35

= 91.6 %